Center Independent Research & Development: GSFC IRAD

Technology Advancements Enabling FPI v2.0 (FPIv2.0)

Completed Technology Project (2016 - 2018)

Project Introduction

Goddard Flight Center's Code 673 built the MMS Fast Plasma Investigation (FPI) providing unprecedented quality and temporal resolution for electron and ion measurements in the Earth's environment. We plan to retain our leadership in this area by advancing components of the current detector system for the benefit of future Heliophysics projects.

The MMS FPI team proposes **an instrument concept maturation project** to develop the next generation of Heliophysics space plasma particle detectors with the goal of resolving the differential directional flux of electrons and ions in 128 energy bins between 1eV to 35keV, 32 instantaneous angle bins covering a 180^{O} FOV, quantifiable deflections at the extremes of the energy sweeps, and 1-4ms temporal resolution. Characteristics of the system identified for advancement are:

- Optimization of the detector system, including:
    - eliminate spatial dependence of microchannel plate (MCP) gain
    - full characterization of dynamic and static MCP saturation
    - reduction of anode crosstalk
    - reduction of internal photoelectron susceptibility
- Increased geometric factor
- Options for refining/eliminating fast stepping power supply
- Options for ion composition determination

Anticipated Benefits

Plasma particle detectors are an indispensable instrument on most Heliophysics and Planetary space missions. This project will enable faster measurements of charged particles in space thereby increasing the spatial and temporal resolution of the environmental conditions around Earth and other planetary bodies.

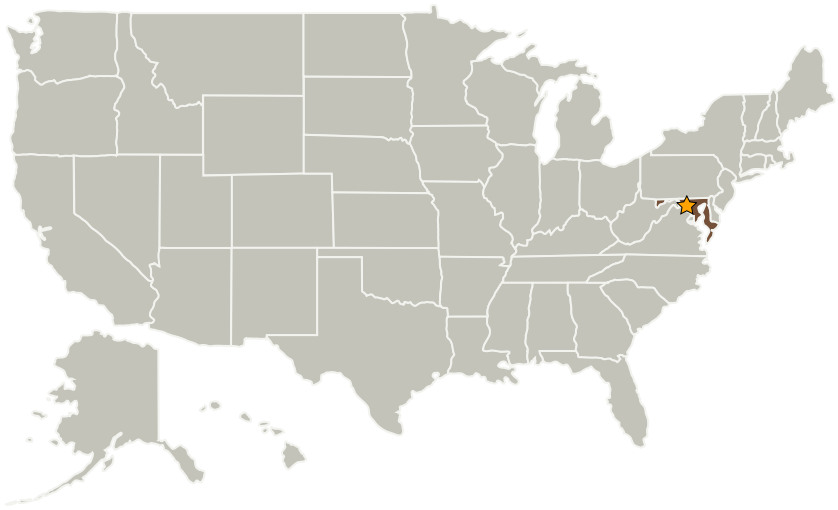
Fast Plasma Investigation (FPI)

Table of Contents

Technology Advancements Enabling FPI v2.0 (FPIv2.0)

Completed Technology Project (2016 - 2018)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

Nikolaos Paschalidis

Principal Investigator:

Daniel J Gershman

Co-Investigators:

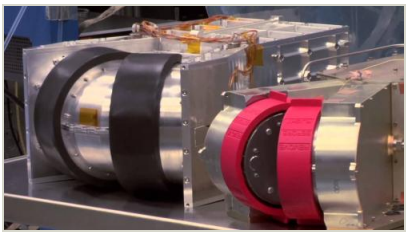
Levon A Avanov
Alexander C Barrie
Dennis J Chornay
Daniel J Gershman
Robert G Michell
Barbara L Giles

Technology Advancements Enabling FPI v2.0 (FPIv2.0)

Completed Technology Project (2016 - 2018)

Images

Fast Plasma Investigation (FPI)
Fast Plasma Investigation (FPI)
(https://techport.nasa.gov/image/26346)



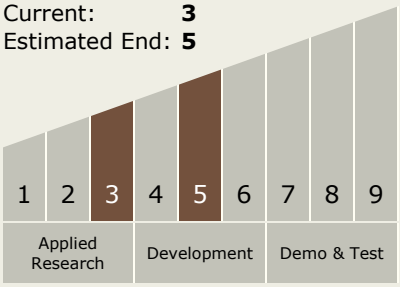
Fast Plasma Investigation (FPI) on the Magnetospheric Multiscale (MMS) mission
Fast Plasma Investigation (FPI) on the Magnetospheric Multiscale (MMS) mission
(https://techport.nasa.gov/image/26347)

Project Website:

http://sciences.gsfc.nasa.gov/sed/

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.1 Field and Particle Detectors

Target Destinations

Earth, The Moon, Mars

Supported Mission Type

Projected Mission (Pull)